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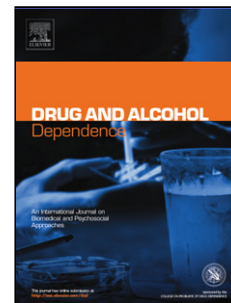
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Title: Are brief alcohol interventions targeting alcohol use efficacious in military and veteran populations? A meta-analysis*

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Are brief alcohol interventions targeting alcohol use efficacious in military and veteran populations? A meta-analysis*

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Highlights

- Rates of hazardous and harmful alcohol use are high in military populations
- Brief alcohol interventions (BAIs) appear to be effective in the general population
- This is the first meta-analysis of BAIs in military and veteran populations
- Existing BAIs do not seem to be efficacious in military and veteran populations
- Research on BAIs is lacking in serving military populations

Abstract

Background: Rates of hazardous and harm-related drinking are higher in the military and veteran populations compared to the general population. Brief alcohol interventions (BAIs) targeting alcohol use appear to reduce harmful drinking in the general population. However,

* Supplementary material can be found by accessing the online version of this paper at <http://dx.doi.org> and by entering doi:...

less is known about the efficacy of BAIs targeting alcohol in military and veteran populations.

Methods: A systematic review and meta-analysis was conducted to assess the type and efficacy of BAIs used to reduce alcohol use in military and veteran populations conducted from 2000 onwards. The meta-analysis was conducted using a standardised outcome measure of change in average weekly drinks (AWDs) from baseline to follow-up.

Results: The search revealed 10 papers that met the search criteria, and that reported data on 11 interventions included in the systematic review. 8 papers (reporting on 9 different interventions) were included in the meta-analysis after 2 papers were excluded for which the relevant outcome data were not available. There was no overall effect of BAIs; a non-significant weekly drink reduction of 0.95 drinks was found (95% CI, -0.17 to 2.07). This lack of efficacy persisted regardless of military group (conscripts, serving or veterans) and method of delivery (i.e., face-to-face, web-based or written information). Furthermore, sensitivity analyses revealed this small drink reduction was driven mainly by a single study.

Conclusions: Based on these findings, existing BAIs do not seem to be efficacious in reducing alcohol use in military populations, despite some encouraging results from one electronic intervention which was of extensive duration.

Keywords: alcohol; brief alcohol intervention; military; meta-analysis

1. Introduction

1.1 Alcohol use in the military

A high prevalence of hazardous and harmful alcohol use has repeatedly been reported in the US and the UK forces (Bray et al., 2009; Fear et al., 2007). In the US Army, the

prevalence of binge drinking (i.e., ≥ 4 or ≥ 5 drinks on one occasion, for women and men respectively) is 43% (Stahre et al., 2009), compared to 23% in the general population (Substance Abuse and Mental Health Services Administration, 2011). Even when controlling for age and gender, U.S. military personnel drink more than the general population (Bray et al., 2009). Similarly, both hazardous drinking (drinking which increases the risk of mental or physical harm) and harmful drinking (which results in consequences to mental or physical health) (Babor and Higgins-Biddle, 2001), are higher in the UK military compared to the general population. 67% of men and 49% of women in the UK Armed Forces drink at least at a hazardous level (Fear et al., 2007), compared to 38% of men and 15% of women in the general population (Coulthard et al., 2002).

It is worth noting, however, that data from other countries do not seem to reflect the same situation. While rates of hazardous and harmful drinking are not reported, there seems to be lower levels of ‘risky drinking’ (i.e., > 2 drinks per day) among Australian serving and former Defence Force members (Waller et al., 2015) and a lower prevalence of alcohol use disorders in the German military (Trautmann et al., 2016), compared to the general population.

1.2 Brief alcohol interventions in the general population

The literature on alcohol interventions in the general population shows promising results in tackling hazardous and harmful drinking, in particular in relation to brief alcohol interventions (BAIs). A systematic review of systematic reviews suggested that face-to-face BAIs are effective in reducing hazardous drinking in primary healthcare settings (O’Donnell et al., 2014). Computer-delivered alcohol interventions are also promising, with a meta-analysis of randomised controlled trials (RCTs) showing an overall significant reduction of alcohol use in the general population (effect size (d) 0.20, $p < 0.001$) and which did not show heterogeneity between studies of diverse characteristics (Rooke et al., 2010).

According to WHO/AUDIT guidelines, BAIs are of short duration (less than ten minutes) (Babor and Higgins-Biddle, 2001) and can be delivered face-to-face (Bertholet et al., 2005) or online (Kypri et al., 2004). The content is variable but should include brief advice, skills training and practical advice to reduce drinking, and follow-up (Babor and Higgins-Biddle, 2001). These interventions are not designed for use in those with alcohol dependence/alcohol use disorder, who generally require more intensive management (Babor and Higgins-Biddle, 2001).

Many BAIs focus on providing personalised normative feedback (PNF), which compares the subject's drinking to the general population norm (i.e., a social norms comparison). This approach aims to challenge misconceptions of peer behaviour by contrasting what one perceives to be the drinking norm with the actual norm. For example, in the general population, young people tend to overestimate the drinking behaviour of their peers, and these perceived norms strongly predict their alcohol consumption (Borsari & Carey, 2003). Correcting overestimations of peer drinking norms using PNF results in a reduction in drinking in college students (Miller et al., 2013).

1.3 Brief alcohol interventions in the military and veteran populations

While BAIs have been used in the military to tackle alcohol use, a meta-analysis looking at overall effects of these has yet to be carried out in this population. Military and veteran populations are unique and differ from the general population, not least in their exposure to an entrenched drinking culture (Jones and Fear, 2011). However, like in the general population, misperceptions of peer drinking exist in military and veteran populations. Both veterans and active duty service members tend to overestimate their peers' drinking, and these misperceptions predict greater personal drinking (Neighbors et al., 2014; Pedersen et al., 2016)). As a result, though only in its infancy, research is now looking at the most

effective ways of employing PNF interventions to reduce drinking in military and veteran populations (e.g., Pedersen et al., 2016).

1.4 Aims of the current study

This systematic review aimed to explore which BAIs have been used in the military and to conduct a meta-analysis to determine whether these interventions are efficacious in reducing alcohol use in military and veteran populations.

2. Methods

2.1 Search strategy

The literature search was conducted in March 2017 using Medline, EMBASE and PsycINFO electronic databases to identify relevant studies published since January 2000. The search terms used were: alcohol AND (army OR armed forces OR armed services OR veterans OR soldiers OR raf OR royal air force* OR military OR navy) AND (intervention OR prevention). The search was applied to include articles where search terms appeared in the title, abstract or keywords. The de-duplicate function was applied.

2.2 Inclusion criteria

1. The study should have been published in a peer-reviewed journal
2. The study should include an intervention and a control group
3. The intervention measure should have been designed primarily to tackle hazardous or harmful alcohol use
4. The intervention should be a brief alcohol intervention that is psychological in nature (not limited by the number or duration of sessions offered)
5. There should be a quantitative measure of alcohol use pre- and post-intervention
6. The sample should be a military (conscripts or serving) or veteran (ex-serving) population
7. The sample should only include participants over the legal drinking age for the country of the study

8. The overall sample size of the study should be $n \geq 100$

2.3 Exclusion criteria

1. Studies aimed at treatment of alcohol dependence are excluded
2. Studies including participants who are alcohol dependent or have a substance use disorder diagnosis are excluded
3. Interventions of a pharmacological nature are excluded

2.4 Data and analysis

An excel file was created to collate data which were extracted by a researcher (AD) (see Appendix Tables 1a, 1b and 1c¹). The data extracted from the articles were: author, title and date of publication; population (i.e., conscripts, veterans or serving members of the military), recruitment method, information about the population, sample size and sample characteristics (age and gender); inclusion/exclusion criteria in relation to alcohol use; study design (RCT or not) and details of control condition; measurement of alcohol use; overview of the intervention, primary component of intervention, number of sessions in intervention, delivery of intervention, timing and number of follow-ups, attrition rate at follow-up; and outcome measures (alcohol use).

2.5 Quality rating

The quality of included studies was rated independently by two researchers (AD and CM) using a 27-item checklist developed to assess the quality of both RCTs and non-randomised trials (Downs and Black, 1998). The mean inter-rater reliability across study ratings was 87.4% (range 73.1 – 92.3%). Disagreements in quality scores were rated by a third researcher (LG) and any queries were discussed.

2.6 Meta-analysis

¹ Supplementary material can be found by accessing the online version of this paper at <http://dx.doi.org> and by entering doi:...

The meta-analysis was conducted using a standardised outcome measure of change in average weekly drinks (AWDs) from baseline to follow-up (baseline mean minus follow-up mean). The weighted estimate reported in the meta-analysis reflects the difference between the control and intervention group in terms of within-group mean differences. Where a study assessed AWDs at multiple follow-ups, data from the first time point was used.

Where AWD data was not available from the data provided in the paper, the authors were contacted to provide this data, or raw data from which we could calculate this measure. Where papers provided data in relation to the past 30 days, AWDs were calculated as follows:

$$\text{AWDs} = \frac{\text{no. of drinking occasions} \times \text{no. drinks per drinking occasion}}{30 / 7}$$

If the within-group mean difference and corresponding standard deviation (SD) were not reported, they were imputed based upon guidance in the Cochrane handbook (Higgins, Deeks, & Altman, 2008). The SD was calculated using a formula that includes a pre-calculated correlation coefficient. This coefficient was derived based upon data from a study included in the current meta-analysis which did report the SD for a mean difference score (Cucciare et al., 2013). This correlation coefficient should reflect how similar the baseline and final measurements were across participants. This was calculated separately for the control and the intervention calculations, which equalled 0.747 and 0.578 respectively. The SD for the mean difference was then calculated separately for the control and intervention arms using this correlation coefficient in addition to the baseline and final SDs for the control or intervention groups (Higgins et al., 2008).

Meta analyses were conducted to produce weighted estimates and to examine the between study heterogeneity using STATA v11.0 (StataCorp, 2009). The I^2 statistic was used to assess between study heterogeneity (Higgins et al., 2008). Random effects models

assessed between study heterogeneity. The meta-analyses were stratified by i) type of military population (conscripts, serving and veterans), ii) intervention delivery method and iii) quality rating.

3. Results

3.1 Study selection

The search identified 1487 abstracts. Screening of these resulted in the exclusion of 1389 abstracts which were not relevant, or which were literature reviews, with 98 abstracts remaining. The full texts were screened, resulting in the exclusion of a further 88 articles which did not meet the inclusion criteria. This resulted in a total number of 10 papers reporting data on 11 interventions that were included for systematic review (1 paper (Pemberton et al., 2011) reported data on 2 separate interventions). Two papers were further excluded from the meta-analysis, as further relevant data was not made available to us by the authors, leaving a total of 8 papers (reporting on 9 interventions) included in the meta-analysis.

3.2 Study quality

Quality rating scores across studies ranged from 16-26, out of a maximum of 32. Bertholet et al. (2015) scored highest (26) and the mean quality rating score was 20.

3.3 Study characteristics

The extraction data for the 11 interventions (from 10 articles) are summarised in Tables 1a (study overview and sample), 1b (intervention details) and 1c (outcomes). For the purposes of this paper, the two interventions assessed by Pemberton and colleagues (2011) are treated as two separate interventions. Of the included interventions, 8 were randomised controlled trials (Bertholet et al., 2015; Brief et al., 2013; Cucciare et al., 2013; Gaume et al., 2011; Gmel et al., 2013; Helstrom et al., 2014; Martens et al., 2015; Pedersen et al., 2017), and 3 were non-randomised (for example, a quasi-experimental intervention) (Hallgren et al.,

2009; Pemberton et al., 2011). In terms of samples, 5 recruited US veterans (Brief et al., 2013; Cucciare et al., 2013; Helstrom et al., 2014; Martens et al., 2015; Pedersen et al., 2017), 2 recruited active US military personnel (Pemberton et al., 2011), 4 recruited conscripts (Bertholet et al., 2015; Gaume et al., 2011; Gmel et al., 2013; Hallgren et al., 2009). 4 interventions involved male participants only (Bertholet et al., 2015; Gaume et al., 2011; Gmel et al., 2013; Hallgren et al., 2009), while the other 7 included both males and females (Brief et al., 2013; Cucciare et al., 2013; Helstrom et al., 2014; Martens et al., 2015; Pedersen et al., 2017; Pemberton et al., 2011). The 11 interventions provided data on 8617 participants in total.

3.4 Overview of interventions

Six interventions were web-delivered (Bertholet et al., 2015; Brief et al., 2013; Cucciare et al., 2013; Pedersen et al., 2017; Pemberton et al., 2011), one was telephone-delivered (Helstrom et al., 2014), one used written information (Martens et al., 2015) and three were delivered face-to-face. Of these, 2 were delivered individually by a psychologist or counsellor (Gaume et al., 2011; Gmel et al., 2013), and one was a group intervention (Hallgren et al., 2009).

The web-delivered interventions all involved personalised feedback about drinking and many included behaviour change strategies or motivational techniques. Personalised feedback varied in the extent of personalisation, from age-matched norms from the general population (Bertholet et al., 2015) to gender-, age- and ethnicity-matched veteran norms (Pedersen et al., 2017).

Two interventions involved veteran participants (Brief et al., 2013; Cucciare et al., 2013), two involved serving military (Pemberton et al., 2011) and one involved conscripts (Bertholet et al., 2015). The most intensive, duration-wise, was VetChange (Brief et al., 2013), comprising of eight 20-minute modules over a period of eight weeks, which included

personalised feedback (pertaining to general population norms) and cognitive and behavioural strategies for management of high-risk drinking scenarios.

The telephone intervention (Helstrom et al., 2014) was delivered to veterans and involved 3 telephone sessions (at 3 month intervals), which involved motivational enhancement, decisional balance (weighing up pros and cons of drinking) and a personalised behaviour change plan.

The written information intervention (Martens et al., 2015) was delivered to veterans and included personalised feedback, information on veteran-specific gender norms and alcohol-related risks and problems.

The two psychologist-delivered interventions (Gaume et al., 2011; Gmel et al., 2013) comprised one partially-structured motivational interviewing session delivered one-on-one to conscripts. In one of the studies (Gmel et al., 2013), half of the intervention group received an additional telephone booster session (20 minutes) at 3 months post-intervention, delivered by the same psychologist.

The group intervention (Hallgren and colleagues, 2009) involved a two day PRIME for Life programme (developed in the US) which included group discussions and interactive presentations.

3.5 Efficacy of interventions (AWDs)

The mean differences in Average Weekly Drinks (AWDs) between control and intervention groups from baseline to follow-up are displayed in Table 1c. Gmel and colleagues (2013) report data on an intervention and the same intervention study with an added booster session. These data are considered separately in the meta-analysis. The total number of participants included in the meta-analysis was 5240. Figure 2² displays the weighted mean differences in AWDs between control and intervention groups from baseline

² Supplementary material can be found by accessing the online version of this paper at <http://dx.doi.org> and by entering doi:...

to follow-up. The overall pooled effect of the interventions was non-significant, weighted mean difference of 0.95 AWDs (95% CI, -0.17 to 2.07). Overall there was high heterogeneity between studies ($I^2 = 68.2\%$). Heterogeneity appeared to be due to one study (Brief et al., 2013), after omitting that study the heterogeneity was reduced to $I^2=0.0\%$, and the overall weighted mean difference reduced from 0.87 to 0.37 AWDs.

Within conscripts, there was a weighted mean difference of 0.17 AWDs (95% CI, -0.59 to 0.93). Within serving members, there was a weighted mean difference of 0.68 AWDs (95% CI, -0.64 to 1.99). Within veterans, there was a weighted mean difference of 2.39 AWDs (95% CI, -1.51 to 6.29). All of these differences were not statistically significant. Furthermore, the relatively larger effect seen in veterans is largely driven by the Brief et al.,(2013) intervention.

Face-to-face interventions showed a weighted mean difference of 0.16 (95% CI, -0.88, 1.20) (Figure 3²). Within web-based interventions, there was a weighted mean difference of 1.81 (95% CI, -0.06 to 3.68). Again, the wide 95% CI appeared to be due to the study by Brief et al.,(2013).

Grouping studies by quality scores, Figure 4² demonstrates that the confidence intervals for the low quality papers appear to be wider, suggesting that we can be less confident in their effects. In relation to the medium and high quality studies, it seems to show that the effects of the interventions are minimal and not significant.

3.6 Effectiveness of interventions (other outcomes)

Similar to the findings for AWDs, the web-delivered intervention VetChange (Brief et al., 2013) showed a significant reduction at the end of the intervention in Drinks per Drinking Day, and Percent Heavy Drinking Days. Furthermore, alcohol consumption continued to show a significant decrease in the VetChange intervention group between the end of the 8-week intervention and the 3-month follow-up. The web-delivered Drinker's Check-Up

(Pemberton et al., 2011) resulted in a significant reduction in average Drinks per Drinking Day, and Frequent Heavy Episodic drinking at one month post-intervention compared to controls (though these reductions did not persist at 6-months). The internet-based intervention adapted from Alcoquiz (Bertholet et al., 2014) found a significantly greater reduction in AUDIT scores in the intervention group at 6-month follow-up compared to controls. The Personalised Normative Feedback (PNF) intervention showed a significant reduction in average drinks consumed per occasion, and average days binge drinking at 1 month post intervention compared to controls (Pedersen et al., 2017).

4. Discussion

This systematic review identified a small number of studies ($n=10$) that have investigated the efficacy of interventions ($n=11$) targeted to alcohol consumption at a hazardous level in the military. A meta-analysis (of $n=8$ studies, $n=9$ interventions) showed no efficacy of brief alcohol interventions in terms of AWD. Only one of 11 interventions showed a significant effect, which was an intensive rather than brief alcohol intervention (Brief et al., 2013). The lack of efficacy persisted regardless of military group and method of delivery (i.e., face-to-face, web-based or written information).

The web-delivered VetChange intervention (Brief et al., 2013) found significant within-intervention-group reductions in AWDs and percentage of heavy drinking days, with reductions persisting at 3-month follow-up. The intervention group weighted alcohol reduction was 8 AWDs greater than that of controls. In terms of content, VetChange included the four elements of brief counselling that the WHO/AUDIT recommends as essential for alcohol intervention programmes. It is also interesting to note that this was the only intervention that included content aimed at building a support system for the participant. As it is the only study shown to be efficacious, a replication of the findings in another study would

be helpful. However, it is worth emphasising that this study was of low quality (Figure 4³). Furthermore, the intervention was delivered over an 8 week period and therefore can not truly be classified as a BAI.

In terms of relevant long-term results, Bertholet et al.'s (2014) internet-based intervention reported a significant reduction in AUDIT scores at 6-month follow-up compared to controls. It would be interesting to see which questions on the AUDIT contributed to lower AUDIT scores at 6-month follow-up given that changes in AWDs and binge drinking episodes were not significantly reduced. It is possible that answers to questions pertaining to the harmful consequences of drinking (e.g., feelings of guilt, injuries, memory lapses) were responsible for the AUDIT score reductions. It is advisable that future research takes this into account when measuring and reporting outcomes. This would help identify whether interventions are tackling both alcohol reduction and risky behaviours, or whether different tailored interventions are necessary for each of these outcomes.

4.1 Limitations of the current literature

One major limitation of the current literature is the inconsistency of the reporting of outcomes within and across studies. The majority of the studies used a version of the AUDIT questionnaire (or part thereof) at baseline to assess alcohol use. However, only one study (Hallgren et al., 2009) consistently used this tool as a measure of alcohol consumption at follow-up. Other methods of follow-up assessment varied between studies (including the Quick Drinking Screen (Sobell et al., 2003) and Timeline Followback (Sobell and Sobell, 1992)), and even the components of these varied between studies. Although we were able to gather comparable outcome data from most of the authors, this would not have been apparent from just reading the papers. Furthermore, papers needed to be excluded from analysis if the authors did not make necessary data available to us.

³ Supplementary material can be found by accessing the online version of this paper at <http://dx.doi.org> and by entering doi:...

A notable finding within this review was the short duration between intervention and final follow-up. While one study assessed subjects at 20 months post-intervention, the majority of studies had a maximum follow-up of 6 months. WHO/AUDIT guidelines (Babor and Higgins-Biddle, 2001) do not specify a follow-up duration for individuals drinking at a harm-related level post-intervention. However, periodic monitoring is recommended which may be reduced to 6 monthly or annual visits if the patient has achieved or is making efforts to achieve their targeted alcohol consumption level.

Two of the studies included in this review clearly addressed all four of the essential components of brief counselling recommended by the WHO/AUDIT guidelines (Brief et al., 2013; Pemberton et al., 2011). Only one study provided any indication of intervention fidelity (Pemberton et al., 2011), who reported 82% of participants completed the full intervention to which they were assigned. Furthermore, attrition was generally high across studies, ranging from 7-71% at the first follow-up time-point, and two studies did not comment on attrition.

This systematic review clearly highlights a lack of research on alcohol interventions in active serving military members, with only one of the included studies conducted in this group (Pemberton et al., 2011). Furthermore, while studies looking at conscripts may be carried out in a military setting, it may be that they have not been enrolled long enough for the military culture to have made a significant impact on their drinking.

4.2 Strengths and shortcomings of this review

This is the first study to use a meta-analysis to assess the type and efficacy of brief alcohol interventions targeting alcohol use in a military population. A clear strength of this review is the comparison of interventions using a standardised outcome – the number of average weekly drinks (AWDs). While studies reported outcomes using various methods, the authors requested or extracted data on AWDs from each included study. It is worth noting, however, that only one paper reported intention to treat analyses.

It was expected, given the previous literature in the area, that the majority of interventions to be included would be BAIs, but no restrictions were made on length of duration, resulting in the inclusion of an extensive 8-week intervention (Brief et al., 2013). In relation to the quality of the included studies, an itemised checklist was used to assess quality (Downs and Black, 1998) but, as with most checklists, all items were given equal weighting, when some items could be considered as more important and deserving of more weighting.

Furthermore, we are limited in our analysis of the efficacy of face-to-face interventions, as those included in this review used broadly the same intervention. Therefore, our results do not reflect a range of face-to-face interventions.

4.3 Future research

Primarily this review highlights a dearth of interventions for alcohol use that have been tested in serving military populations. In general, there is a lack of RCTs assessing the efficacy of BAIs in military populations. This research has also identified the need for future studies to engage participants in longer-term follow-up to enable comprehensive assessment of the efficacy of these interventions in the longer term.

Future studies should include the details of the baseline assessment process carried out before the intervention. Given that satisfaction in the general population seems linked to the relationship with the healthcare professional delivering the intervention (Lock, 2004), these details should be included for consideration in military and veteran population studies which are not web-delivered.

From the studies included in this meta-analysis, BAIs do not seem to be effective in reducing alcohol use in the military. Given that the most encouraging results seem to be from VetChange (Brief et al., 2014), an 8-module intervention delivered over 8 weeks, it is possible that BAIs per se, are not the most appropriate for use in the military population.

It is worth considering why interventions in the military have not been shown to be

efficacious in this current study, in contrast to WHO recommendations, which support the efficacy of such interventions in the general population. In the general population, personalised normative feedback is being utilised in BAIs to reduce excessive alcohol use in a variety of population groups. While most of the interventions included in this analysis incorporated an element of personalised feedback, only two studies (Martens et al., 2015; Pedersen et al., 2017) used military- or cohort-specific normative feedback (veteran specific gender norms and veteran specific age and gender norms respectively).

Social norms theory research highlights that misconceptions of more proximal peer groups (e.g., same gender norms) seem to exert more influence on drinking behaviour than more distal groups (e.g., gender neutral norms) (Borsari and Carey, 2003; Lewis, MA; Neighbors, 2007). Using gender- and age-specific data, Pedersen and colleagues (2017) found that correcting misconceptions of peer drinking norms mediated intervention efficacy. However, perceived closeness to the veteran peer references presented in their PNF intervention did not moderate intervention efficacy, leading the authors to suggest that using same-gender veterans as the normative reference group for young adult veterans may be sufficient to reduce alcohol use, even if “closer” reference groups exist. While this may be the case for the young adult veterans included in their study, it seems pertinent that future research determine the most relevant normative feedback to use in active military and veteran populations of varying ages, thereby maximising delivery and efficacy of social norm based BAI interventions in future.

5. Conclusion

This review revealed a dearth of studies published in this area, particularly in serving military populations. Studies included in this review and meta-analysis used various alcohol measures, but using the comparable measure of AWDs, brief alcohol interventions in military and veteran populations were not efficacious. This study finds limited evidence that longer,

more intensive interventions may be more helpful. Future research investigating the most suitable normative feedback for delivery of social norms based interventions seems imperative to maximising efficacy of BAIs in military and veteran populations.

Author Disclosures

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Nothing declared.

Contributors

LG and AD contributed to the conception and design of this study, AD, CM and LG conducted the data extraction, LG conducted the statistical analysis, AD and LG revised and drafted the article and all authors contributed to and approved the final draft.

Conflict of Interest

None.

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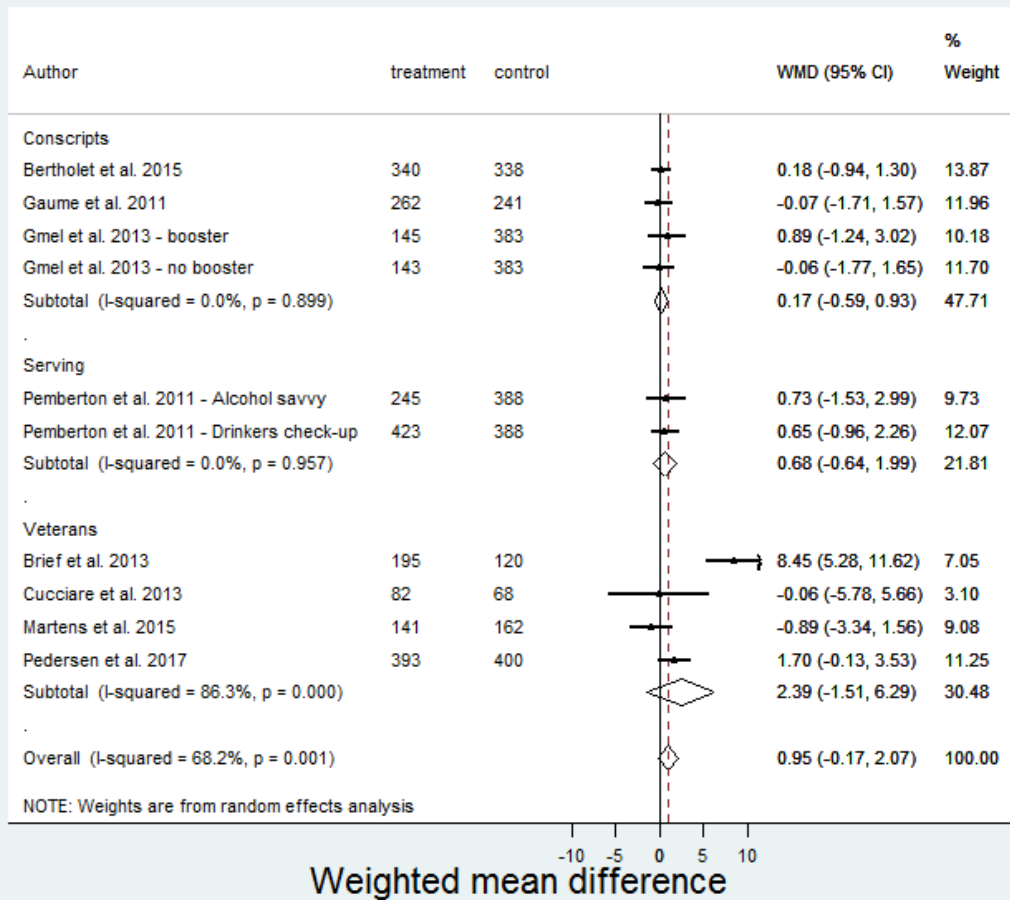
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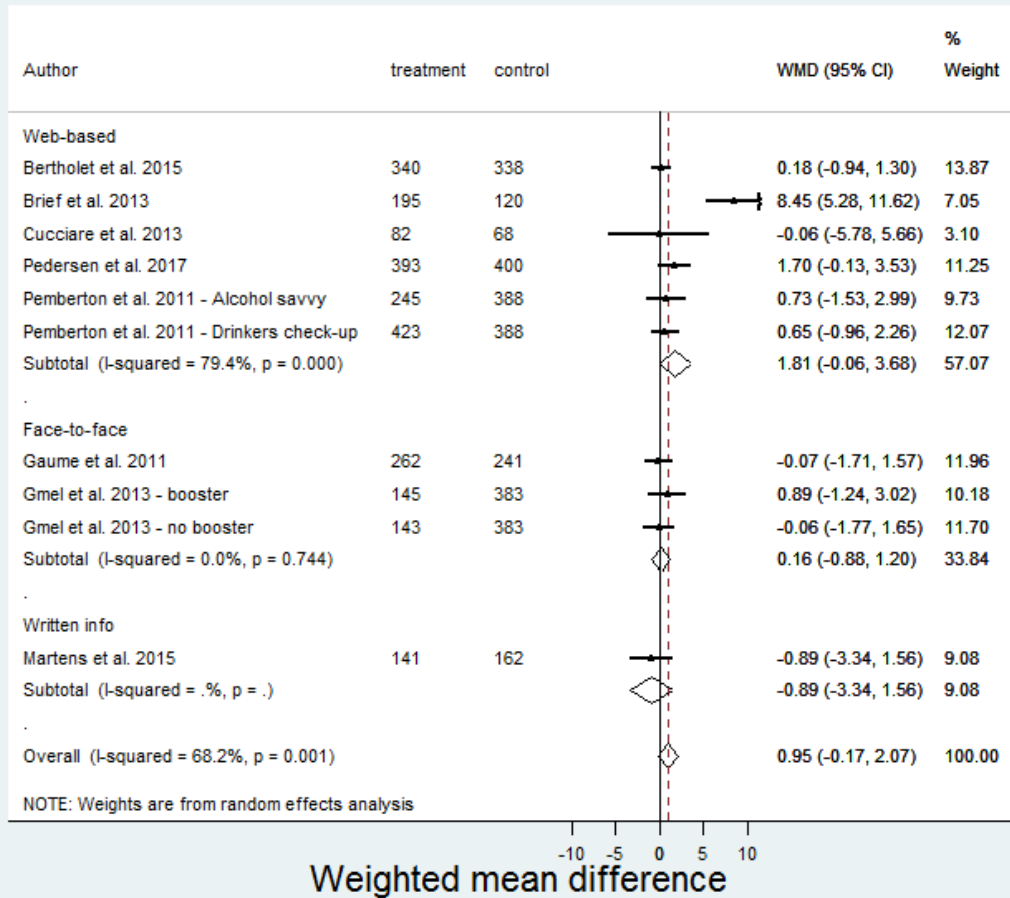
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Effect of intervention on average weekly drinks



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